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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/536,908	ASOGAWA ET AL.	
	Examiner	Art Unit	
	Bernard E. Souw	2881	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *5/27/2005 (Transmittal + Pre-Amdt)*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-8,10-12,16,17,21-26,30,31,34 and 35* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-5,8,10,16,17,21-26,30,31,34 and 35* is/are rejected.

7)☒ Claim(s) *6,7,11 and 12* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *27 May 2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *5/27/2005*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Priority

1. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), (JP 2002-349282), filed 11/29/2002, which papers have been placed of record in the file.

2. Receipt is acknowledged of papers submitted under 35 U.S.C. 371 (PCT/JPO3/15539 and WO 2004/051232 A1) which papers have been placed of record in the file.

Information Disclosure Statement

3. Receipt is acknowledged of information disclosure statement (IDS) submitted on 05/27/2005. The submission is in compliance with the provisions of 37 CFR 1.97.

A signed copy of the information disclosure statement is here enclosed.

Preliminary Amendment

4. The Preliminary Amendment filed 05/27/2005 has been entered. The present Office Action is made with all the suggested amendments being fully considered.

The title has been changed.

Claims 9, 13-15, 18-20, 27-29, 32 and 33 have been cancelled.

Claims 1-8, 10-12, 16, 17, 21-26, 30, 31, 34 and 35 are pending in this Office Action.

Objection to the Specification

5. The disclosure is objected to because it is difficult to understand. It is not written in proper English and is replete with idiomatic and grammatical errors. A few examples and suggestions for revision are as follows:

(a) In the Abstract:

- Lines 1-2 should better read: "*Individual components are accurately separated from a sample containing a high concentration of components-to-be-separated.*"
- Lines 10-11 should better read: "*...so as to alternately and repeatedly execute a first external force, by which ....*"
- Line 13, the wording "*imposing pattern*" should be deleted, since it only makes the already difficult-to-understand language even worse.

(b) In the Specification (only a small sample out of a large number of similar errors):

- Page 1, lines 3-9, should better read, "*A small amount of sample introduced from a channel for separation can only yield a slight amount of target components. Failure in obtaining target components with high concentration raises a problem of degradation in the accuracy of the analysis. On the other hand, widening the introduction channel, aiming at increasing the amount of sample introduced into the channel, broadens ...*""
- Page 1, lines 11-15, should better read, "*Charging a high concentration of sample despite a narrow introduction channel results in aggregation of the sample itself, degrades the resolution, and fails to carry out a desirable separation.*"
- Page 35, line 3, *[electrode]* should better read "*electrode**s***".
- Page 35, line 5, *[differed]* should better read "*differing*".
- Page 35, line 8, *[has described]* should better read "*describes*".
- Page 35, line 9, *[are differed]* should better read "*differ*".
- Page 35, lines 12-13, should better read "*216 to 220 remain constant, i.e., by applying a voltage such that different voltage values appear on the individual channels*".

Appropriate correction is required. Applicant is obligated to also correct other errors of the same art that have not yet been hitherto identified due to limited space and time.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

7. Claims 5, 8, 21, 22 and 34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Carle et al. (USPAT 5,167,790) in view of Chan et al. (USPAT 6,696,022).

► As per claim 21, Carle et al. disclose a separation method using a separation apparatus shown in Fig.1, comprising a channel 16 through which a sample containing components-to-be-separated moves, as recited in Col.8/ll.34-37; a plurality of "compartments" provided to said channel ("compartment" broadly interpreted as lanes A,B,C,D,E defined by sample wells 17 in Fig.4, as recited in Col.11/ll.6-9); and an external force imposing unit 13,14 shown in Fig.1 and Fig.3, imposing external (electrophoretic) force to said components-to-be-separated (channel 16) so as to allow them to move through said channel, wherein said external force is repetitively imposed sequentially in the direction departing from a sample introduction position and in the direction approaching the position on said channel (i.e., reverse-field electrophoresis), as recited in Col.3/ll.53-68 and Col.10/ll.66-68, to thereby fractionate said components-to-be-separated into any of said "compartments" (i.e., fractionated bands 1-8, contained in lanes A-E shown in Fig.4), as recited in Col.11/ll.6-39.

However, Carle's "compartment" is not truly a compartment, since it is not enclosed, as generally understood in the art under the term "compartment". Even farther away from true "compartment" are the bands 1-8. In this regard, Chan et al. disclose a device shown in Fig.1 and Fig.2 for stretching and selecting molecules based on their lengths (i.e., size), the selection function expressly recited in the Abstract/ll.4-6, Col.1/line 13, and Col.27/ll.28-39 & 51-66. Chan's "selection" has the same connotation as Carle's "separation", since in order to "select", Chan et al. must firstly separate or fractionate the sample, as Carle also does, as recited in Col.27/ll.34-39 + 51-67 and Col.28/ll.1-9, while optionally enhancing the separation within Chan's narrow channels

(downstream from the post region depicted in Fig.22) using Carle's reverse-field electrophoresis. Chan's use of electrophoresis is recited in Col.29/ll.15-20, more specifically in Col.31/ll.3-50, and especially in ll.19-25 and ll.30-35, thus rendering obvious the claim limitation that the external (electrophoretic) force allows the sample to move through the channel(s).

In particular, Chan's embodiment shown in Fig.1 (xxi), recited in Col.20/ll.42-43, seems appropriate to one skilled in the art for enclosing Carle's lanes A-E within parallel channels or compartments, i.e., each of Chan's five channels enclosing each of Carle's five lanes. As a result, each lane or channel of Fig.1(xxi) contains one or more fractionated samples (=bands), i.e., bands 1-2 in channel A, band 3 in channel B, band 4 in channel C, band 5 in channel D and bands 6-8 in channel E. The claim limitation "*to thereby fractionate said components-to-be-separated into any of said compartments*" is more precisely satisfied by giving each channel of Fig.1(xxi) the form of a series of compartments as shown in Fig.2b, 2c, 2h, or particularly, 2m, either with or without the posts, wherein the length of each compartment is made to match the migration distance of the fractionated species.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Carle's apparatus having open "compartments" with Chan's true compartments or channels, since the enclosed compartment or channel structure allows a clean separation of the fractionated samples with little chance of inter-mixture, thus enhancing the resolution of the device.

One of ordinary skill in the art would have been motivated to use parallel channels that allow high resolution of separation, in order to achieve high throughput of sample separation (or selection, or screening, or in general sense, sample characterization), as taught by Chan et al. in Col.15/ll.61-64.

► Regarding claim 22, the migration ranges of the fractionated sample are shown by Carle et al. as bands 1-8 shown in Fig.4, as recited in Col.11/ll.6-39. Carle's migration range as shown in Fig.4 is caused by imposition of the electrophoretic force, as recited in Col.10/ll.44-49 and Col.11/ll.6-15. Upon combining with Chan et al. using one of the embodiments shown in Fig.2(a)/3rd from top, 2(b), 2(d), 2(h) or 2(m)/bottom, Carle's migration ranges (that depend on the electrophoretic force and the obstacles or posts) are to be matched to the length position of Chan's compartments, in order to fractionate the sample ***into*** Chan's compartments, thus rendering obvious the entire limitations of claim 22.

► As per claim 34, Carle's system comprises an external force switching control unit 13 shown in Fig.1 and 3, as recited in Col.9/ll.11-14.

► Claim 5 differs from claim 21 by the additional limitations of (a) interception units for intercepting the components-to-be-separated moving through the channel in the sample forwarding direction of said channel, and (b) a plurality of compartments partitioned by adjacent ones of said interception units.

Chan's plurality of compartments (or channels) shown in Fig.2(a)-(f), 2(h), 2(l) and 2(m) are separated by narrow fluid channels furnished with posts/obstacles, here

functioning as "interceptors" that "intercept" the fractionated samples; these interceptors shown as dark/shredded areas in front of the narrow channels (indicating the sample forwarding direction), thus rendering obvious the claim limitation of *intercepting the components-to-be-separated moving through the channel in the sample forwarding direction of said channel.* See Chan's Col.27/ll.28-39 + 51-66 and Col.28/ll.1-9 in reference to Fig.22, wherein Chan's detection region within the narrow channel in Fig.22 may be optionally modified by Carle's reverse-field electrophoresis to enhance the separation, as recited previously.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Carle's reverse-field electrophoresis apparatus by Chan's plurality of compartments or channels separated by interceptors capable of intercepting the fractionated components (compare Fig.2(b) with Fig.22)), since the interceptors would further improve the resolution of the separation process by pre-selecting the fractionated components and preventing them from mixing up with other components in adjacent compartments.

One of ordinary skill in the art would have been motivated to use Chan's plurality of channels partitioned by adjacent interception units, in order to allow easy detection and extraction or collection of desired target components, thus achieving high throughput of the separation (or selection) process, as taught by Chan et al. in Col.15/ll.61-64.

► . As per claim 8, Chan's embodiments include channel structures having bent or curved geometry, as shown in Fig.1(xii), (xvi) and (xvii), and recited in Col.8/ll.31-36, 43-

45 and 48-51, as well as in Col.20/ll.19-21 + 31-33. Chan's channel structures depicted in Fig.2(d), 2(e), and particularly 2(h), clearly show the bent portion being intercalated with interception units (= posts or "*obstacles*" = dark/shredded areas recited in Col.20/line 31), thus rendering obvious the claim limitation that "*the bent portion of the channel configures the interception unit*".

8. Claims 16, 17, 30 and 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Carle et al. in view of Chan et al., and further in view of Shimoida et al. (USPAT 7,105,354)).

Carle et al. as modified by Chan et al. show all the limitations of claim 16, as previously applied to the other independent claims 5 and 21, except the additional limitations of (a) a channel having a main channel and sub-channels formed as being branched out from said main channel; and (b) an external force imposing unit configured to sequentially execute a plurality of external force imposing patterns differing in direction of imposition of the external force relative to said channel, thereby fractionating the sample into the sub-channels.

Some of Chan's embodiments are furnished with a main (central) channel and sub- (or side) channels formed as being branched out from said main channel, as shown in Fig.1(vii), 1(viii), (ix), (x), (xi), as recited in Col.20/ll.7-17, and Fig.2(c)/middle, 2(f), 2(j), 2(m)/top, as recited in Col.8/ll.28-30 + 65-67. Furthermore, Carle's external (electrophoretic) force imposing unit (not shown) sequentially imposes "*(force) patterns*

differing in direction of imposition of the external force relative to said channel' (=main channel; singular!), as expressly recited in Col.3/ll.53-68.

While Chan et al. do not expressly recite in which direction the sample is moving, i.e., whether from the branches merging into the main channel, or from the main channel diverting into the sub-channels, Shimoide et al. expressly recite a particular embodiment in which the sample is diverted from the main channel into the sub-channels, as recited in Col.26/ll.38-40 (as opposed to Shimoide's other embodiment recited in Col.11/ll.630-65 and Col.12/ll.55-670).

It would have been obvious to one skilled in the art that the purpose of the sub-channels is to fractionate the sample into the sub-channels, as taught by Shimoide et al., and to detect, extract or collect the fractionated components with higher resolution, as taught by Chan et al.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Carle's apparatus by Chan's plurality of sub-channels formed as being branched out from a main channel, since such a branching structure allows sample injection from a single inlet port, and yet multiple component extraction from a plurality of collection ports, as taught by Shimoide et al.

One of ordinary skill in the art would have been motivated to use Chan's branching structure for achieving high throughput of the separation (or selection, or screening) process, as taught by Chan et al. in Col.15/ll.61-64.

► Regarding claim 17, Chan's embodiment shown in Fig.1(viii) obviously comprises a main channel that is conventionally equipped with a sample introduction port just to

make it working (i.e., equivalent to Carle's sample well 17 shown in Fig.1). From Shimoide's teaching (as previously recited), the purpose of the sub-channels is to fractionate the sample and to detect, extract or collect the fractionated components with higher resolution in the sub-channels. In a specific use of Chan's embodiment of Fig.1(viii) in combination with Shimoide's teaching recited previously (Col.21/38-40), each of the fractionated components must be entered into a separate sub-channel. To that effect, the fractionated sample must be firstly moved forward to reach a branching point of a specific sub-channel, for which the electrophoretic force is applied in a forward direction, i.e., "*departing from the sample introduction port,*" thus rendering obvious the last partial limitation of the claim. In order to fractionate the sample into its components, Carle et al. further teach to repeatedly reverse the direction of the electrophoretic field, as recited in Col.8/ll.37-45. As understood from Carle's teaching, this reverse field pushes a fractionated component into a sub-channel, which is only effective for a particular fractionated sample that is just located at a particular branch point, thus rendering obvious the other partial limitation of the claim.

► As per claim 30, Chan's separation method for an embodiment shown in Fig.1(viii) obviously begins with sample introduction through a port(s) equivalent to Carle's sample well(s) 17 shown in Fig.1. As recited previously, the first step is to move the sample forward from the introduction port downstream, for which the external electrophoretic force is applied in a forward direction, i.e., departing from the sample introduction port, as taught by Carle et al. In order to fractionate the sample and separate the components along the main channel direction, Carle et al. further teach to

repeatedly reverse the direction of the electrophoretic field, as recited in Col.8/ll.37-45, thus rendering obvious the remaining steps of the claim.

► Regarding claim 31, the duration of Carle's external force in the first step (of claim 30), i.e., in the forward direction, is kept constant at 3 sec (while being repeated for 12 hours long), as recited in Col.10/ll.66-68.

9. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Carle et al. in view of Chan et al., and further in view of Ebersole et al. (USPAT 5,578,460).

Carle et al. as modified by Chan et al. show all the limitations of claim 10, as previously applied to the parent claim 5, except the recitation of a collection port. Although "collection port" is no other than "sample outlet", which is inherent to Chan's capillary channel(s), a particular recitation of the wording "collection port" is not recited by Chan et al. The terminology is rendered obvious by Ebersole et al., as recited in Col.3/ll.8-24.

10. Claims 1-4 and 23-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Carle et al. in view of Chan et al., Anderson et al. (USPGPub 2001/00366720) and Pethig et al. (WO-97/34689).

► Carle et al. as modified by Chan et al. show all the limitations of claim 1, as previously applied to the other independent claims 5, 16 and 21, except the recitation of (a) alternately executing a first external force imposing pattern by which the external force is imposed to said components-to-be-separated in the forward direction along said

channel, and a second external force imposing pattern by which the external force is imposed to said components-to-be-separated in the direction opposite to the forward direction along said channel; and (b) one, or two or more check valves disposed in said channel, partitioning the plurality of compartments and suppressing back flow of said components-to-be-separated.

Limitation (a) is recited by Carle et al. in Col.3/ll.61-66 (reverse-field electrophoresis), here further modified by Chan's capillary channels, similar to what has been previously applied to the independent claims 5, 16 and 21.

Limitation (b) is rendered obvious by Anderson et al. (USPGPub 2001/00366720) in view of Pethig et al. (WO-97/34689).

Anderson et al. disclose a fluid treatment device shown in Fig.3 that also includes sample separation channel (sect.[0011]/ll.3-5), in which electrophoresis is used to separate/analyze the sample, as recited in sect.[0083]/ll.1-6 and [0084]/ll.1-11, particularly using the embodiment shown in Fig.3, which includes true compartments 202, 206, 210, 214 and 218, connected to fluid channels 208, 212 and 216, respectively, as recited in sect.[0111]/ll.1-6. Particularly regarding claim 1, a check valve is used in Anderson's separation apparatus, as recited in sect.[0112]/line 9, more particularly in sect.[0133]/ll.1-6 from bottom, and further, in sect.[0166]/ll.1-10.

Anderson's method (based on reaction chambers) is accomplished by applying differential pressures to the compartments (reaction chambers) to transport the fluid, as recited in sect.[0010], [0015] and [0016]. Anderson's reaction chambers may be replaced with fluid separation channels, as taught by Anderson et al. in sect.[0011]/ll.1-

5, in which sample transport is accomplished by electrophoretic method, as recited in sect.[0083]/ll.1-6 and [0084]/ll.1-11. In this regard, Pethig et al. teach that in a sample separation technique using electrophoretic force, the fluid medium itself does not need to flow through the channel(s), as recited in the Abstract/ll.2-5.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Carle's apparatus having open "compartments" with Anderson's true compartments furnished with check valves, since -- with no differential pressure applied to Anderson's compartments – the check valve remains effective for the fractionated components as the only part that still moves within the channels, thus preventing the latter from leaking-back and mixing-up with the other fractionated sample(s) in the adjacent compartment(s).

One of ordinary skill in the art would have been motivated to modify Carle's & Chan's apparatus with Anderson's separate compartments as modified by Pethig et al., since the check valves allows a clean separation of the fractionated samples with little chance of intermixture, thus enhancing the resolution of the device.

► Regarding claim 2, Carle's channel extends in a straight form, as can be seen in Fig.1-4. Anderson's channels shown in Fig.3, 6A, and 6B are also straight in form. Thus, Carle's channel as modified by Anderson is also straight in form.

► Regarding claim 3, Anderson's check valve blocks a back flow of the fluid medium and moves it towards the downstream side of the channel, as expressly recited in sect.[0133]/ll.1-8 from bottom. However, upon combining with Carle's & Chan's electrophoresis method, the fluid medium itself does not move, as previously taught by

Pethig et al. in the Abstract/ll.2-5. Therefore, in Carle's apparatus as modified by Anderson's check valve, it is the components-to-be-separated which are blocked from back-flow by the check valve, since the fluid itself is not in motion.

► Regarding claim 4, the claim limitations is rendered obvious by Carle et al. in Col.3/ll.53-68.

► Regarding claim 23, the repeated steps of applying the external force within one compartment towards downstream, and then reversed towards the upstream, is rendered obvious by Carle et al., as recited in Col.3/ll.53-68.

► Regarding claims 24 and 25, the limitation that the duration of imposing external force is kept constant in every execution step of claim 23, i.e., in the forward as well as in the backward direction, is implicated by Carle et al. in Col.3/ll.65-66, wherein the external force in the forward direction is higher than the voltage applied in the reverse direction, in order to have a forward net migration of the samples.

► Regarding claim 26, the limitation that the duration of external force in the second step of claim 23 (upstream, in reverse direction) can be equal to, or longer than, in the first step (downstream, in forward direction) is inclusively implicated by Carle et al. in Col.3/ll.64-68, whereby it is self-obvious to adjust the external force in the second step to be smaller than in the first step, in order to ensure a forward net migration of the sample.

11. Claim 35 is rejected under 35 U.S.C. 103(a) as being unpatentable over Carle et al. in view of Chan et al., Anderson et al. and Pethig et al., and further in view of Hancock et al. (USPAT 5,716,825).

Carle et al. as modified by Chan et al., Anderson et al. and Pethig et al. show all the limitations of claim 35, as previously applied to the parent claim 1, except the recitation of a specific mass spectrometric system being coupled to the sample separation apparatus of claim 1.

Hancock et al. disclose a MALDI/TOF mass spectrometry (MS) system, as recited in Col.11/ll.9-16, the MS system comprising:

A pre-treatment (or pre-analysis) unit separating a biological sample depending on the molecular size or properties, as recited in Col.11/ll.9-16 (wherein a DNA obviously represents a biological sample, as recited in Col.1/ll.46-55), and subjecting said sample to a pre-treatment (preparation) for an enzyme digestion treatment, the sample preparation or pre-treatment expressly recited in Col.7/ll.66-67 and Col.8/ll.1-10, whereas the enzyme digestion treatment is expressly recited in Col.2/ll.9-14; a unit subjecting said sample pre-treated by said pre-treatment unit to the enzyme digestion treatment, as already recited in Col.2/ll.23-24; a drying unit drying the enzyme-digestion-treated sample, as recited in Col.10/ll.39-46; and a mass spectrometry unit subjecting the dried sample to mass spectrometry, as recited in Col.10/ll.59-63, wherein the term "*dried*" being expressly recited in line 61. The limitation that Hancock's microchannel system including the pre-treatment unit comprises a miniaturized unit, is recited in Col.3/ll.1-20, more specifically as "*microchannel*" and "*chip*" in Col.4/ll.34-55.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to couple Hancock's mass spectrometer system to the sample separation apparatus of Carle et al. as modified by Chan et al., Anderson et al. and Pethig et al., in order to determine and/or identify not only the size, but also the mass and the molecular constituents of the fractionated sample.

One of ordinary skill in the art would have been motivated to modify the sample separation apparatus of Carle et al., Chan et al., Anderson et al. and Pethig et al., particularly with Hancock's MALDI/TOF spectrometer, since the latter not only is capable of fragmentizing the fractionated sample, but is further equipped with a number of processes relating to enzyme digestion treatment and/or research, all those in the form of a tiny microchip that would allow automated and batch processing.

Indication of Allowable Subject Matter

12. Claims 6, 7, 11 and 12 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Reasons for Indication of Allowable Subject Matter

13. The following is a statement of reasons for the indication of allowable subject matter:

► Claim 6 is allowable for reciting an external force imposing unit that is configured to equalize the magnitude of external force imposed in each of the plurality of

compartments recited in claim 5, or, in simple language, the external force imposed on each of the compartments are substantially equal in magnitude. Considering that the migration range of a particular fractionated component is not necessarily equal one to the other, whatever purpose Applicant has in mind to impose a substantially equal magnitude of external force in each compartment, even if they are alternately imposed in opposite directions, is non-obvious to those of ordinary skill in the art. This unique design choice is just Applicant's invention not anticipated or rendered obvious by any prior art.

► Claim 7 is allowable for reciting a positive external force and a negative external force being alternately applied to compartments along the forward direction. The conventional reverse-field electrophoresis separation method is to apply reverse external forces alternately in time, but not necessarily in spatial positions. Therefore, Applicant's method of applying reverse voltages in spatial sequence, i.e., alternately to the compartments along a forward direction, is a unique choice that is non-obvious to those of ordinary skill in the art, and is just the essence of Applicant's invention not anticipated or rendered obvious by any prior art.

► Claim 11 is allowable for reciting the limitation that the length of a channel placed on the further downstream side has a larger length, which may result in equal migration times required by the fractionated components to move forward within each successive compartments. Whatever purpose Applicant has in mind, it is non-obvious to require larger lengths for channels placed further downstream. This is a unique design choice

having a special purpose that underlines Applicant's invention not anticipated or rendered obvious by any prior art.

► Claim 12 is allowable for reciting the limitation that a smaller external force is to be applied to a channel placed further downstream, which also may result in about the same migration time required by the fractionated components to move forward within each successive compartments (since the fractionated component further downstream moves forward at a higher migration velocity). Again, irrespective of whatever purpose Applicant has in mind, it is non-obvious to require a smaller external force to be applied to a channel placed further downstream. This is another unique design choice underlining Applicant's invention not anticipated or rendered obvious by any prior art.

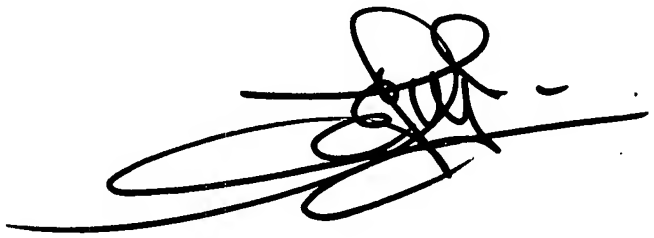
Communications

14. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Bernard E Souw, Ph.D., whose telephone number is 571 272 2482. The examiner can normally be reached on Monday thru Friday, 9:00 am to 5:00 pm..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Robert Kim can be reached on 571 272 2293. The central fax phone number for the organization where this application or proceeding is assigned is 571 273 8300 for regular communications as well as for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 571 272 5993.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



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